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**HONEYWELL
INFORMATION
SYSTEMS INC.**

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No. 43A232499

ENGINEERING PRODUCT SPECIFICATION, PART 1
H-6000 SYSTEM CONTROL CENTER

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Peripheral

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H-60 SYSTEM CONTROL CENTER

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1.0

GENERAL DESCRIPTION

The System Control Center shall be a free-standing unit providing the man-machine interface necessary for efficient operation of a large scale computer system. The System Control Center shall consist of two logically independent units; (1) Console, providing operator/system communication and System Status display providing the operator with system resource utilization and job status information. (2) System Control and Monitor, providing the operator with status and control of significant cabinet oriented functions.

The design objectives of the System Control Center include the following:

- (1) Improve reliability over present console.
- (2) Modern design.
- (3) Increase speed.
- (4) Include system resource monitor.
- (5) Minimize impact on software.
- (6) Improve operator interface.
- (7) Evolve into NPL with minimum re-design.

1.1

SUBSYSTEM DESCRIPTION

The System Control Center (SCC) will provide an efficient and convenient operator interface to the system hardware and to the operating system. An alpha numeric keyboard along with discrete buttons on the operator's control panel will provide operator input capability. Console messages and system status information will be segregated and displayed on two separate 24-line CRT displays by the operating system. A receive only serial printer will monitor the console message traffic providing a hard copy of console communications. The System Control and Monitor unit will provide a centralized means of control and monitoring selected system functions. The status of the system hardware modules will be monitored and displayed on the operator's indicator panel.

1.1

SUBSYSTEM DESCRIPTION (continued)

The SCC display devices will interface with the H-6000 line IOM for operator/system communications and System Status information. Some functions of the operator status panel will interface directly with the system processors. The System Control and Monitor functions will interface with the individual cabinets of the system, not to include the individual peripheral devices.

The physical design and appearance of the SCC shall conform to the Industrial Design as presented by EMIO June 17, 1971, and approved by the Manager, Group Planning and Program Management. The approved Industrial Design was illustrated by a full-scale mock-up and defined in a series of drawings distributed at the June 17 meeting. The only exception to the above mentioned design is that the cabling raceway/light module around the top of the console will be removed. An outline sketch of the design, as approved, is shown in Figure 1.0. This design is accepted as a requirement by PCO and any deviation must be restricted to the improvement of producibility and/or shippability, but shall not in any way alter the outline dimensions or appearance.

1.2

FUNCTIONAL CAPABILITIES

The System Control Center shall provide the necessary man-machine interface to the H-6000 line computer systems required for efficient and convenient operation. Functions provided by the System Control Center shall include the following:

- o Hard copy and soft copy of communications to/from the System Control Center.
- o Continuous display of system utilization, or on request, selected system reports.
- o Continuous monitoring and control capability of the various system modules on an individual cabinet basis.
- o Auxiliary console for remote operational communications.
- o Audible alarm for operator attention.

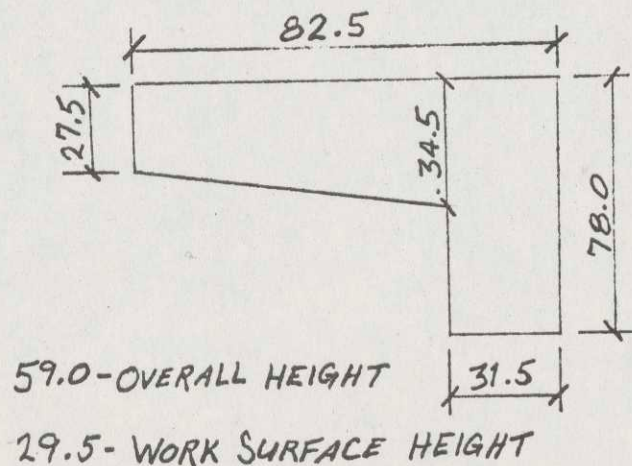
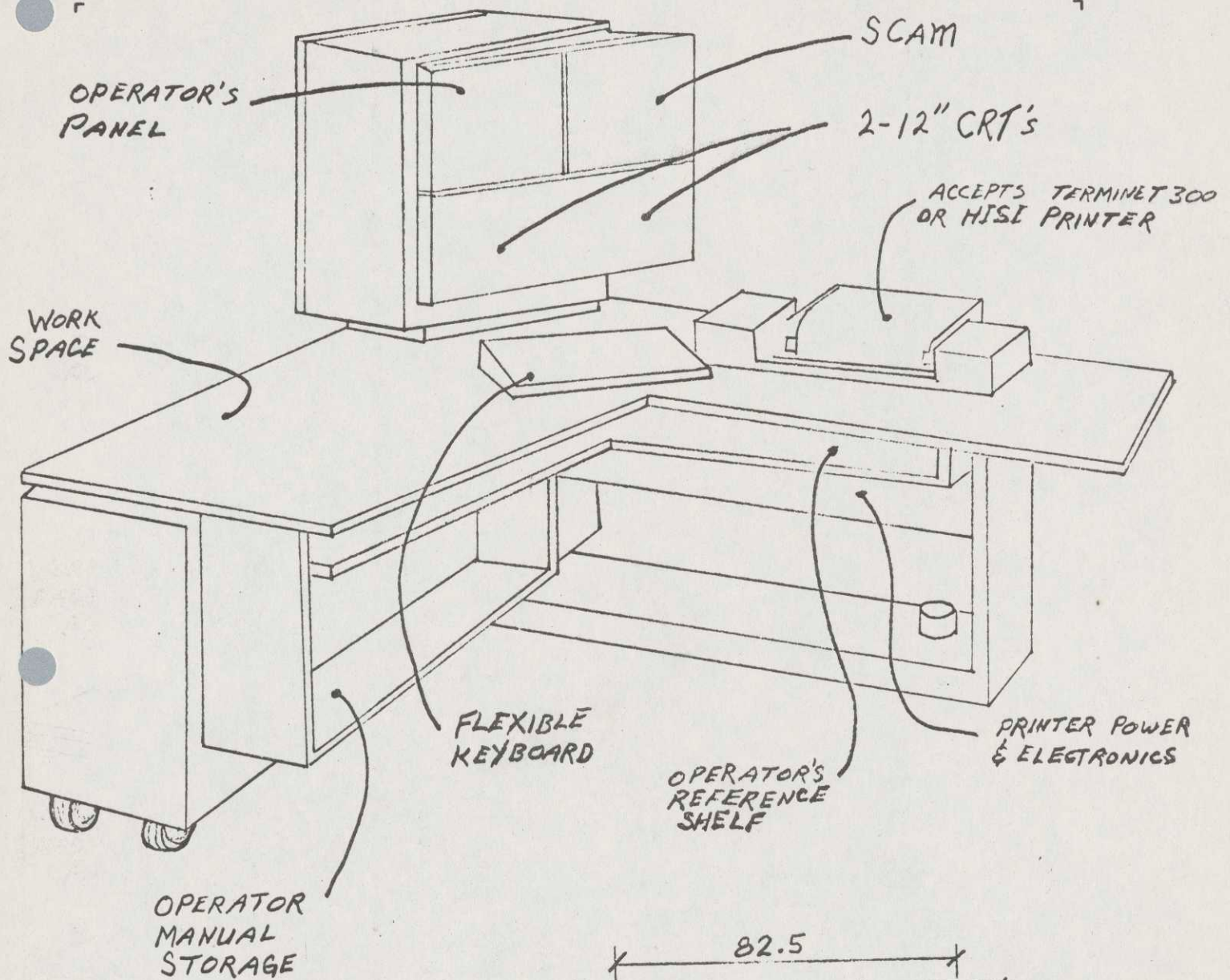


FIGURE 1.0 SYSTEM CONTROL CENTER OUTLINE

1.3

SUBSYSTEM COMPONENTS

The System Control Center shall be modularly designed providing maximum flexibility of configuration. The major subsystem components which can be variously combined to form a control center and all auxiliary consoles are listed below:

- o CRT display device - 80 character/line, 24-line display
- o Keyboard
- o CRT slave monitor
- o Printer - 30 CPS minimum print rate
- o Operator's control and Monitor (SCAM)
- o Self-contained, table top display for auxiliary console
- o Tape Cassette (Future Option)

1.4

SUBSYSTEM ORGANIZATION

The System Control Center shall consist of two logically independent subsystems. The basic or primary unit will be the operator's interactive console. The operator's interactive console shall provide the necessary man-machine interface to support the operation of an H-6000 system. Additional components such as a second display for system resource and status reports, slave monitors, auxiliary consoles and SCAM can be added to improve operational convenience and efficiency. The operator's console is defined in section 2.0 of this document.

The secondary unit of the System Control Center is the System Control and Monitor (SCAM) subsystem. The SCAM unit will provide the operator with additional centralized monitoring and control convenience of the system on an individual cabinet basis. The SCAM will interface directly with each individual cabinet of the computer complex and not via the IOM console channel adapter. The SCAM functions are defined in section 3.0 of this document.

A primary objective of the System Control Center design is to minimize software impact for the initial implementation. The major responsibility for software compatibility will be in the design of the IOM channel adapter, referenced in section 1.6. New software required to support the System Control Center is described in section 4.0.

1.5

SCOPE OF THIS DOCUMENT

The scope of this document is to define the functional and operational requirements for the H-6000 line System Control Center. The CRT displays, printer and tape cassette will be defined in detail in the respective Purchase Specifications.

The functional requirements and software interface of the IOM Channel Adapter for the console will be defined in separate EPS-1.

1.6

APPLICABLE DOCUMENTS

The following documents support this specification:

- o General Design Requirements for 655 and 355 systems 43A177851
- o CRT Display Purchase Specification
- o H-6000 Input/Output Multiplexer Central 43A219604
- o H-6000 Console Channel Adapter EPS-1, 43A232500
- o 655 Common Peripheral Channel 43A219605

1.7

MODULARITY

The basic System Control Center consists of an interactive display, keyboard, indicator/control panel, and an IOM Channel Adapter.

The field upgradable options are:

1. Printer, Receive only (presently a mandatory option)
2. System Status Display
3. CRT slave monitor
4. SCAM
5. Auxiliary consoles

The auxiliary console is not a physical part of the System Control Center, but is included in this EPS-1 since the operator/system communication functional requirements are identical for the interactive console and auxiliary console.

2.0

OPERATIONAL CONSOLE

The system console shall be a free-standing peripheral subsystem, providing the required man-machine communicating interface required for efficient operation of the H-6000 line computer system. The console shall be designed so that modules can be added or deleted without effect on the remainder of the subsystem or re-design of the common hardware or software. The interactive console, system status display and auxiliary consoles will interface with the system via a special IOM channel adapter, referenced in section 1.6.

Each of the communicating devices; i. e. System Status Display, interactive display with monitor printer and each auxiliary console will interface an independent IOM channel adapter. It will be the responsibility of the channel adapter to provide the functions necessary to make the H-6000 system console appear as a 635 console to the operating system.

2.1

CONSOLE MODULES

The operator console shall contain the capability of supporting the following hardware modules:

1. Operational interactive display
2. System Status Display
3. Operator control/indicator panel
4. Keyboard
5. Printer
6. CRT slave monitor
7. Tape Cassette (future option)

2.1.1 Operational Display

The operational display shall be a GPT 350 or equivalent display terminal. This terminal shall provide the operator/system communications presently implemented in the 635 computer system including keyboard entry.

2.1.1 Operational Display (continued)

This display shall provide the capability of supporting a logging printer or future tape cassette offering or both. This display and the system traffic monitor display (described below) shall contain independent control electronics, power supply, I/O interface, 12-inch CRT and an optional composite video output with drivers capable of driving a CRT slave monitor (DMU761, 762, 765, or equivalent) up to 1000 feet. The CRT display shall be of the "no glare design".

The ASC II codes recognized by the display device are shown in Figure 2.0.

The lower case alpha characters defined in columns 6 and 7 will be displayed on the CRT as upper case alpha characters.

In addition to the control codes contained in columns 0 and 1, the display device shall accept and execute the escape sequences defined in section 2.1.5.

2.1.2 System Status Display

The System Status display shall be a GPT 350 or equivalent display terminal. This display shall provide the operator with a complete appraisal of current conditions of system job flow. The operator shall, by means of the operator display keyboard, have the capability of specifying the information desired and the update interval of the display.

Since the System Status display will be identical to the operational display, the software shall be capable of switching channels so that the System Status display can replace the operational display in the event of a failure. It is not intended that a monitor printer be connected to the System Status display except in the event a failure occurs on the operational display and the System Status display is substituted. To support this substitution capability it is required that a switch be provided in the control center that will enable the operator to configure the printer on either display device.

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Bits													
					Col.	0	1	2	3	4	5	6	7
b ₇	b ₆	b ₅	b ₄	b ₃	Row	0	1	2	3	4	5	6	7
0	0	0	0	0	0			SP	0	@	P		p
0	0	0	1	1	1			!	1	A	Q	a	q
0	0	1	0	2	2			"	2	B	R	b	r
0	0	1	1	3	3			#	3	C	S	c	s
0	1	0	0	4	4			\$	4	D	T	d	t
0	1	0	1	5	5			%	5	E	U	e	u
0	1	1	0	6	6			&	6	F	V	f	v
0	1	1	1	7	7	BEL		'	7	G	W	g	w
1	0	0	0	8	8	BS		(	8	H	X	h	x
1	0	0	1	9	9	HT		)	9	I	Y	i	y
1	0	1	0	10	10	LF		*	:	J	Z	j	z
1	0	1	1	11	11		ESC	+	;	K	[	k	
1	1	0	0	12	12	FF		,	<	L	\	l	
1	1	0	1	13	13	CR		-	=	M	]	m	
1	1	1	0	14	14			.	>	N	^	n	
1	1	1	1	15	15		US	/	?	O	_	o	



- CODES NOT RECOGNIZED WHEN RECEIVED BY THE DISPLAY DEVICE

FIGURE 2.0 - DISPLAY DEVICE CODE SET

2.1.3 Operator Control/Indicator Panel

The Control/Indicator functions shall provide the switches and indicators routinely used by the operator. Contained on the panel are System Status indicators, operator switches and indicators, and the Emergency Power-Off Switch.

It is recognized that the implementation of the control/indicator functions will have an impact on the aesthetic value and human factor considerations for the overall design of the System Control Center. The general design of the panel must be such that it will accommodate the minimum and maximum configurations of the System Control Center. Also, some of the controls/indicators are required to support auxiliary console operation.

In specifying the functional requirements of the Control/Indicator functions under a single heading, is not intended to specify a single panel housing for the functions.

In order to allow maximum flexibility of design and a coherent integration of the control/indicator functions into the overall design of the System Control Center, the functions are divided into three groups. The group one functions will require infrequent Access by the operator and will not be included with the auxiliary consoles. The group two functions will require frequent access by the operator and will be required on auxiliary consoles. The group three functions require frequent access and must be mounted on the operator's keyboard. Additional controls/indicators required to support the SCAM unit and must be considered in the design of the indicator/control panel are defined in section 3.0.

The group one and two functions are depicted in Figure 2.1 for descriptive purposes only. The figure is not intended to specify a panel layout or a given type switch or indicator.

2.1.3.1 Group One Controls/Indicators

The functional requirements for the group one controls/indicators are defined below:

Emergency Power-Off/Reset - This switch is to be connected to the System Emergency Power-Off

2.1.3.1 Group One Controls/Indicators (continued)

mechanism. Depressing this switch (OFF) must result in power removal from the computer site (except lights). The RESET button is a manual reset of the OFF button that must be depressed when power is to be re-applied.

System Initialize - This switch shall provide the capability of initializing the system from the console. The implementation of the Initialize function will be altered when the SCAM unit is a part of the System Control Center (see 3.1.1).

System Boot - This switch shall provide the capability of booting the system from the console. The implementation of the Boot function will be altered when the SCAM unit is a part of the System Control Center (see 3.1.1).

AC Breaker ON - This shall be an indicator only, illuminated whenever the console cabinet AC breaker is ON and AC Power is applied to the cabinet.

Console Power ON/OFF - Separate ON/OFF switches shall be provided for control of AC power throughout the console cabinet. The respective switch will be illuminated to indicate the ON/OFF condition of the control center.

Temperature Warning - When one of the Control Center devices exceed normal operating temperature this indicator will be illuminated and the fault alarm sounded. The alarm may be manually re-set, but the indicator will remain illuminated until the cabinet returns to normal operating temperature.

Alarm Re-set - This will manually re-set the temperature warning alarm. When the SCAM unit is contained in the System Control Center this same re-set control will be used to re-set the SCAM fault alarm.

2.1.3.1 Group One Controls/Indicators (continued)

Processor Select - This shall be a four-position switch providing the operator the capability of selecting any one processor for status display. The purpose of this switch is for convenience when the master processor is re-configured. Since most systems will not contain four processors, it is permissible that this function be in an inaccessible area.

Instruction Execution Rate - This indicator shall display the instruction execution rate of the selected processor.

Master Mode - This indicator will be illuminated when the selected processor is in the Master Mode of operation.

DIS MODE - This indicator will be illuminated when the selected processor is waiting for an interrupt.

System Ready - This indicator is an "AND" condition of the Processor Ready and Store Ready. These lines are activated following the successful power-up sequence of the respective cabinets.

2.1.3.2 Group Two Controls/Indicators

The group two functions (except the keyboard select switch) are required for each display device. In general the group two functions will require more frequent access than the group one functions. The controls/indicators of group two are considered in the same "family" for descriptive convenience only. Some of the switches could justifiably be mounted in a less accessible area than others.

The group two functions and their relative accessibility requirements are defined below:

2.1.3.2 Group Two Controls/Indicators (continued)

Keyboard Select - This switch will enable the keyboard to be shared between the two displays of the System Control Center. This switch will require more frequent access by the operator than the other controls of group two and must be mounted in an easy accessibly area. Only one keyboard select switch is required for the System Control Center. All other controls/indicators of group two are required for each display device of the control center as well as auxiliary consoles.

Local/On-Line - This switch will control the operating mode of the individual display device. The Local mode is provided for maintenance use as well as the future use of a tape cassette for rollback capability. This control will be used less frequently than other group two functions, but must be operator accessible.

Line Mode - Of the three display oriented switches, this function will require a more frequent access, or a more accessible mounting. The use of this control will depend on the operating site, job flow and operator efficiency.

In the normal position the message traffic will depend on the operating system. When the Entry Marker is on the last line of the display and the console receives a line feed, the display will roll up one line, losing the top line and adding the new line to the bottom of the display. Should the operator get behind and unable to respond to system messages before they roll off the top of the display, the Line mode may be selected. The Line mode will indicate to the channel adapter to stop transmission and send a new line only when so indicated by the New Line signal activated by the operator.

Print Mode - In the ON position the data transfer rate is limited to the speed of the printer, 30 or 40 CPS, and all communications are directed to the printer interface. It is to be noted that this function (reduced data transfer rate) will not require that a printer be connected to the display device. The 30 or 40 CPS transfer rate will be selectable by back panel patch

2.1.3.2 Group Two Controls/Indicators (continued)

Print Mode (continued)

or switch, and enabled whenever the Print Mode switch is "ON". In the OFF position the display will operate at the maximum (600 CPS) data transfer rate.

KBD Input Mode - This indicator will be illuminated when the operating system places the console in the Read Mode by activating the Read Line. When illuminated this indicator will indicate to the operator that the keyboard is enabled and operator input is permissible.

Operator Attention - This indicator will be illuminated by the operating system when operator attention is required.

2.1.4 Printer

The printer shall be capable of providing a hard copy of the operator/system communications without interfering with the normal operation of the console. The printer shall function on-line. The hard copy shall be produced simultaneous with the console display. The console interface shall provide the capability for the software to indicate the messages that are to be printed. Manual control of this function will be provided by the Print Select switch on the operator's control/indicator panel. This feature is a requirement for future software implementation.

The paper feed mechanism must be capable of feeding three-part fanfold paper direct from the carton and re-stacking the paper in an output tray.

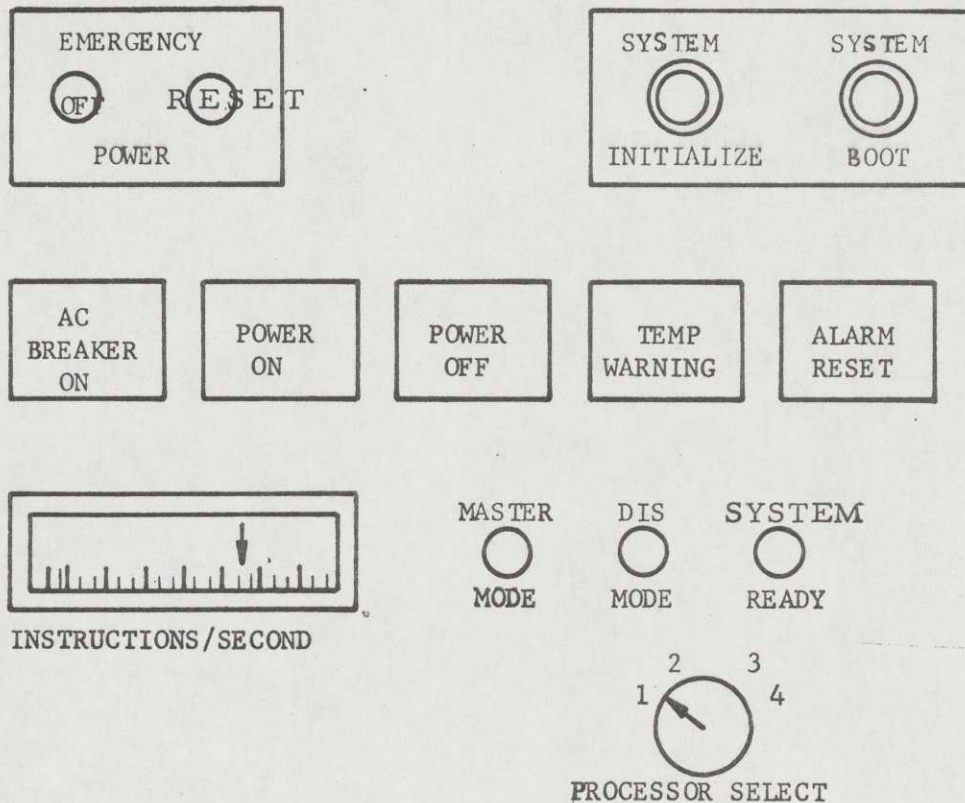
The minimum speed requirements have not been established for the H-6000 console. Presently, 30 CPS is considered marginally acceptable, and the design must allow for an increase print rate of up to 120 CPS.

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GROUP 1

GROUP 2

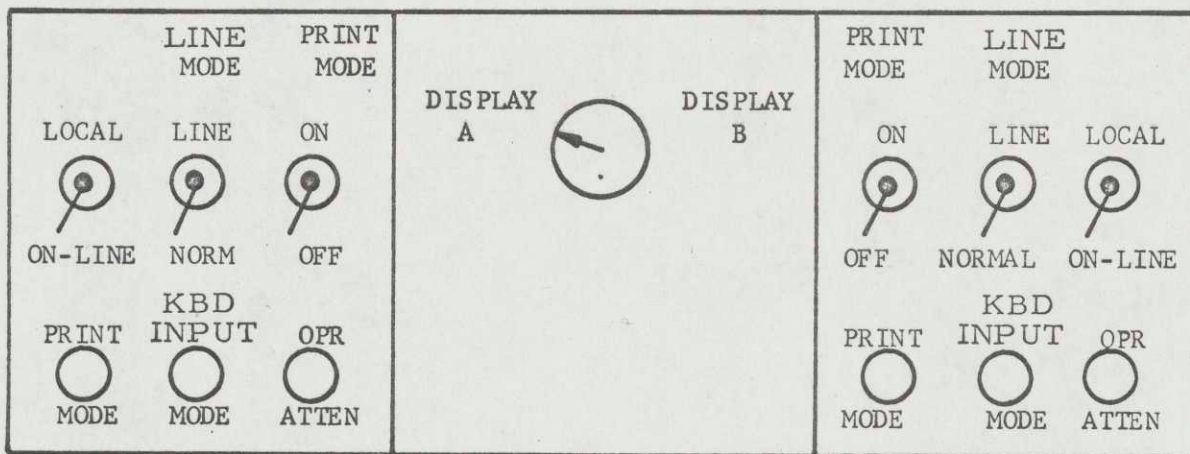


FIGURE 1

GROUPS 1 & 2 FUNCTIONS
 OPERATOR'S CONTROL/INDICATOR PANEL

2.1.4 Printer (continued)

The character code and character set of the printer shall be 7-bit ASC II, compatible with the console display device. Although the display device will display upper case alphas only, it is required that the printer be capable of accepting and printing upper and lower case alpha characters. This requirement is established so that the printer will accept and print the lower case character codes from the keyboard and operator inputs will be easily distinguishable on the hard copy.

The printer shall contain the appropriate controls and indicators that will provide a convenient and efficient operation and maintenance interface.

2.1.5 Keyboard

Manual entry of operator communications shall be through a solid state keyboard with the alpha numeric characters arranged in a conventional typewriter layout. The keyboard shall be capable of supporting an average typing rate of 20 characters per second.

The keyboard will normally be inhibited by the console display device, and enabled only when the console channel adapter activates the Read Line allowing transmission from the console to the system, or the console is in the "local mode" (not on-line).

It is permissible that the control center design allow for a single keyboard being shared by the operational interactive display and the System Status display. The auxiliary consoles will require a dedicated keyboard and must contain the operator controls/indicators required to support operator/system communications. The keyboard layout and keycap legends shall be as shown in Figure 2.2. If the hardware implementation of the control center shares a keyboard between the two display devices, a means of connecting a maintenance (spare) keyboard to either display device must be provided.

2.1.5 Keyboard (continued)

The depression of the keys that have an alpha, numeric or graphic symbol keycap shall generate the corresponding code at the keyboard interface as shown in Figure 2.3. The keyboard will normally generate the lower case alpha character codes. The character code for the upper case alpha and punctuation symbols in the upper portion of the keys will be generated when the shift key is depressed at the same time.

The remaining keys are defined in the following paragraphs.

o Special Keys

The five keys on the top row provide operator control functions (referred to as group three in section 2.1.3) and require frequent access by the operator. The functional implementation of these keys will be the responsibility of the IOM channel adapter. The console will provide the interface electronics only. It is a requirement that the EOM key be "double width" and the remaining four keys on the top row be one and one-half width "stepped" keys as shown in Figure 2.2.

Operator Error - This key provides the operator the capability of signaling the system to disregard the last message input. If the operator recognizes an error when inputting a message, depressing this key before the EOM key will indicate to the system to disregard the preceeding input and allow the operator to re-enter the message. This function will be enabled by the IOM channel when the console is in the Read Mode only.

Attention Re-set - This function will be enabled by the IOM channel only when the operator attention alarm is sounded. When the operator attention alarm is sounded it is required that the operator depress this key in order to shut off the alarm.

New Line - This function will be enabled by the IOM channel only when the Line Mode Switch is in the line position. When the Message Mode Switch is in the line position, depressing this key will signal the IOM channel

2.1.5 Keyboard (continued)

o Special Keys (continued)

that the console will accept another line. This function allows the operator to control the rate that messages are sent to the console display.

Operator Request - This key provides the operator with the capability of requesting permission to input a message.

End of Message - This key allows the operator to indicate that the keyboard input message is complete and the Console Read mode can be terminated.

o Control Keys

The control functions to be provided by the keyboard are defined below:

CTL (Control) - The Control key shall modify the bit configuration of another key when concurrently depressed to generate the control codes in column 0 and 1. When the control key is depressed column 4 shall be transposed into column 0 and column 5 shall be transposed into column 1.

Shift - The shift keys shall operate like a normal typewriter shift key. The shift key determines whether the upper or lower case code shall be generated. It is to be noted that the keys with only one symbol, not including the alpha characters, will generate the respective code for the symbol and will not be affected by the shift key.

Lock - This key shall lock the keyboard in the shift mode. This shall be alternate action key and must be depressed a second time to be released.

BS(Backspace) - The Backspace key will backspace the Entry Marker one character position. When the Entry Marker is at the left margin, subsequent backspaces will have no affect.

2.1.5 Keyboard (continued)

o Control Keys (continued)

Del (delete) - The Delete key will delete the character directly under the Entry Marker.

Return - The Return key shall return the Entry Marker to the left margin.

NOTE: The Backspace, Delete and Return codes are not transmitted to the operating system.

Line Feed - The Line Feed key moves the Entry Marker down one line. When the Entry Marker is on the bottom line, a line feed will cause all lines on the display to move up one line (page scroll) and will have no affect on the Entry Marker. The bottom line of the display will contain spaces after the page scroll. Repeated activation of this function will empty the display, filling all lines with spaces, and leaving the Entry Marker on the last line.

US (Unit Separator) - This key will cause characters on the display to blink so that special emphasis may be given to a portion of the display. The US (blink) code will require a character slot on the display and will be displayed as a "space". All characters between the blink code and the next space character or the right hand margin will blink at approximately 3 times per second.

ESC (Escape) - The ESC key will generate an ASCII ESC code when depressed concurrently with the CTL key. The display device will accept the following escape sequences:

<u>Escape Sequence</u>	<u>Function</u>
ESC 1	Tab Set
ESC 2	Tab Clear
ESC 7	Reverse Line Feed
ESC B	Home Up
ESC C	Forward Space

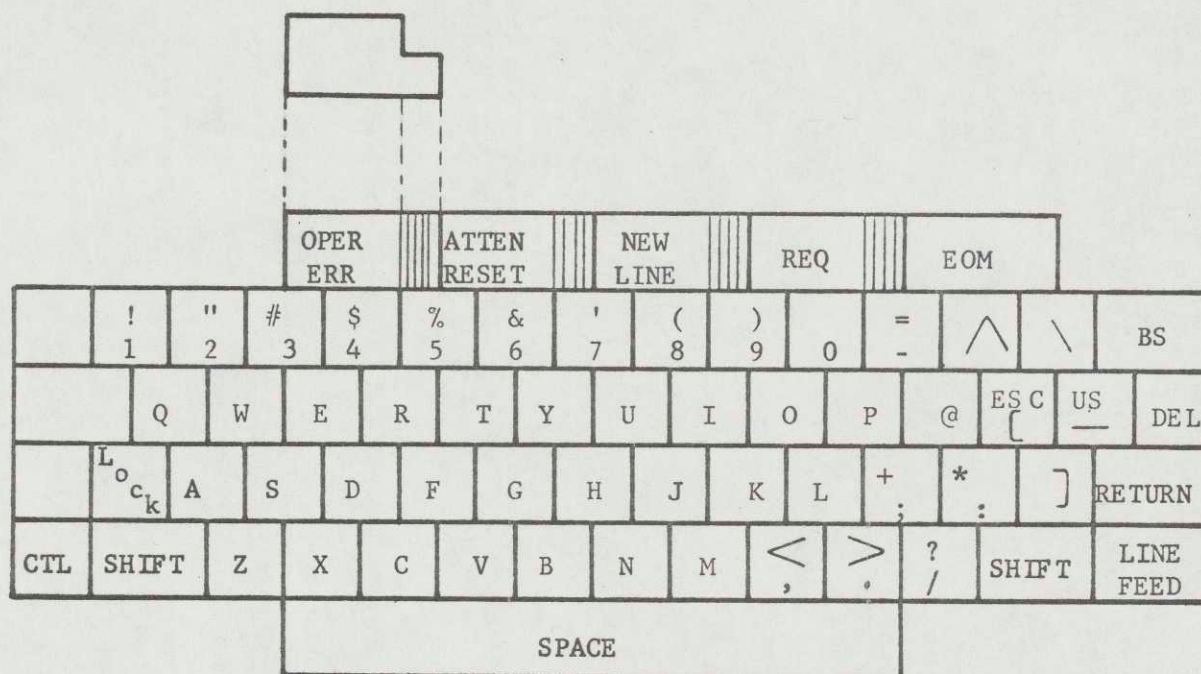


FIGURE 2.2 - OPERATOR'S KEYBOARD

2.1.6 Tape Cassette (Future Option)

It is recognized that a tape cassette unit will not be available for initial implementation on the System Control Center. It is intended that a Read/Write tape cassette monitor be offered as an option on the System Control Center as soon as a suitable device becomes available. The design of the control center must allow for the future addition of the tape unit in order to minimize redesign. The tape unit will have a standard RS232 interface and operate at 120 CPS.

It is a requirement that the tape unit be a dual channel Read/Write device capable of simultaneous data transfer. The intent here is to allow one channel of the tape unit

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Bits b₇ ↓ b₆ ↓ b₅ ↓ b₄ ↓ b₃ ↓ b₂ ↓ b₁ ↓ COL ↓					0 ₀₀	0 ₀₁	0 ₁₀	0 ₁₁	1 ₀₀	1 ₀₁	1 ₁₀	1 ₁₁
					0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	P		p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	\$	5	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	
1	1	0	0	12	FF	FS	,	<	L	\	l	
1	1	0	1	13	CR	GS	-	=	M	]	m	
1	1	1	0	14	SO	RS	.	>	N	^	n	
1	1	1	1	15	SI	US	/	?	O	—	o	

FIGURE 2.3 - KEYBOARD CODE

2.1.6 Tape Cassett (Future Option) (continued)

to serve as the operational interactive display monitor, while a second tape is being read and displayed on another System Status Display CRT display. This would provide console "lookback" without interfering with normal console communications.

The addition of a tape unit shall not in any way interfere with the connectability or operation of the printer monitor.

It is desirable (not required) that the tape unit incorporate an automatic address and search scheme.

For Example --

When recording, the tape unit would increment a counter for every twenty-fourth line recorded. After the twenty-fourth line was recorded, the tape unit would record the counter contents in a page header. This would allow the operator to address a specific page when rollback was desired.

When a new tape is loaded the counter would be re-set and the operator would write a tape label containing date, time and any other pertinent information. At the end of the tape the tape unit would record an end of tape flag and the last page number recorded. The end of tape would also cause the console to go not ready and the operator attention alarm sounded for tape alert.

2.2 AUXILIARY CONSOLE

The Auxiliary Console is not a physical part of the System Control Center (SCC), but provides the same operator/system interactive communication capabilities as the interactive display on the SCC.

The Auxiliary Console is to be a self-contained CRT display with electronics, power supply and keyboard, suitable for placing on a tabletop or counter. The electronics and functional requirements of the Auxiliary Console shall be identical to the display devices used in the System Control Center. The keyboard shall be rigidly attached to the Auxiliary Console display unit. The key layout, labeling and functional requirements of the keyboard shall be identical to the

2.2 AUXILIARY CONSOLE (continued)

keyboard defined in paragraph 2.1.5.

The electrical interface shall be identical to the display devices on the SCC, and shall interface the system via an independent H-6000 IOM Console Channel Adapter, defined in EPS-1 referenced in section 1.6. The I/O connector for system communications cable must be identical to the SCC I/O connector, allowing interchangeability of the SCC and Auxiliary Console cables.

It is to be noted that the Auxiliary Console being a self-contained tabletop display device will not have an operator's control/indicator panel as defined in this document. However, there are certain controls and indicators required to support operator/system communications.

The controls and indicators that must be mounted on the Auxiliary Console (in addition to the keyboard functions) are as follows:

CONTROLS

INDICATORS

Local, On-Line
Line Mode
Print Mode
Attention Re-Set
Power ON/OFF

Keyboard Input
Operator Attention
Power ON/OFF

2.3 CONSOLE CONFIGURATION

The System Control Center shall be designed so that modules can be added or deleted without an adverse effect on any other module of the subsystem and without requiring re-design of the common hardware. The user shall have maximum flexibility in combining the control center modules in a manner that suits a particular need.

The minimum control center configuration is shown in Figure 2.4. Figure 2.5 depicts the maximum configuration. The maximum number of auxiliary consoles that may be connected to a system is three, if a System Status Display is not part of the control center. If the control center contains a System Status Display, the system is limited to a maximum of two auxiliary consoles.

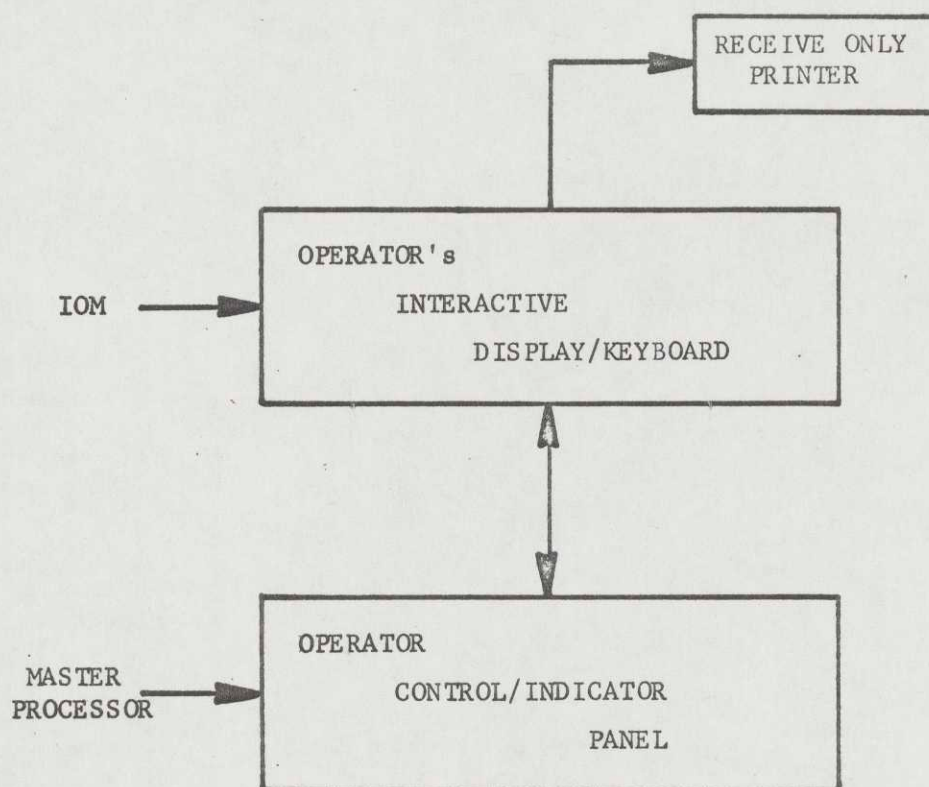


FIGURE 2.4 - SYSTEM CONTROL CENTER - Minimum Configuration

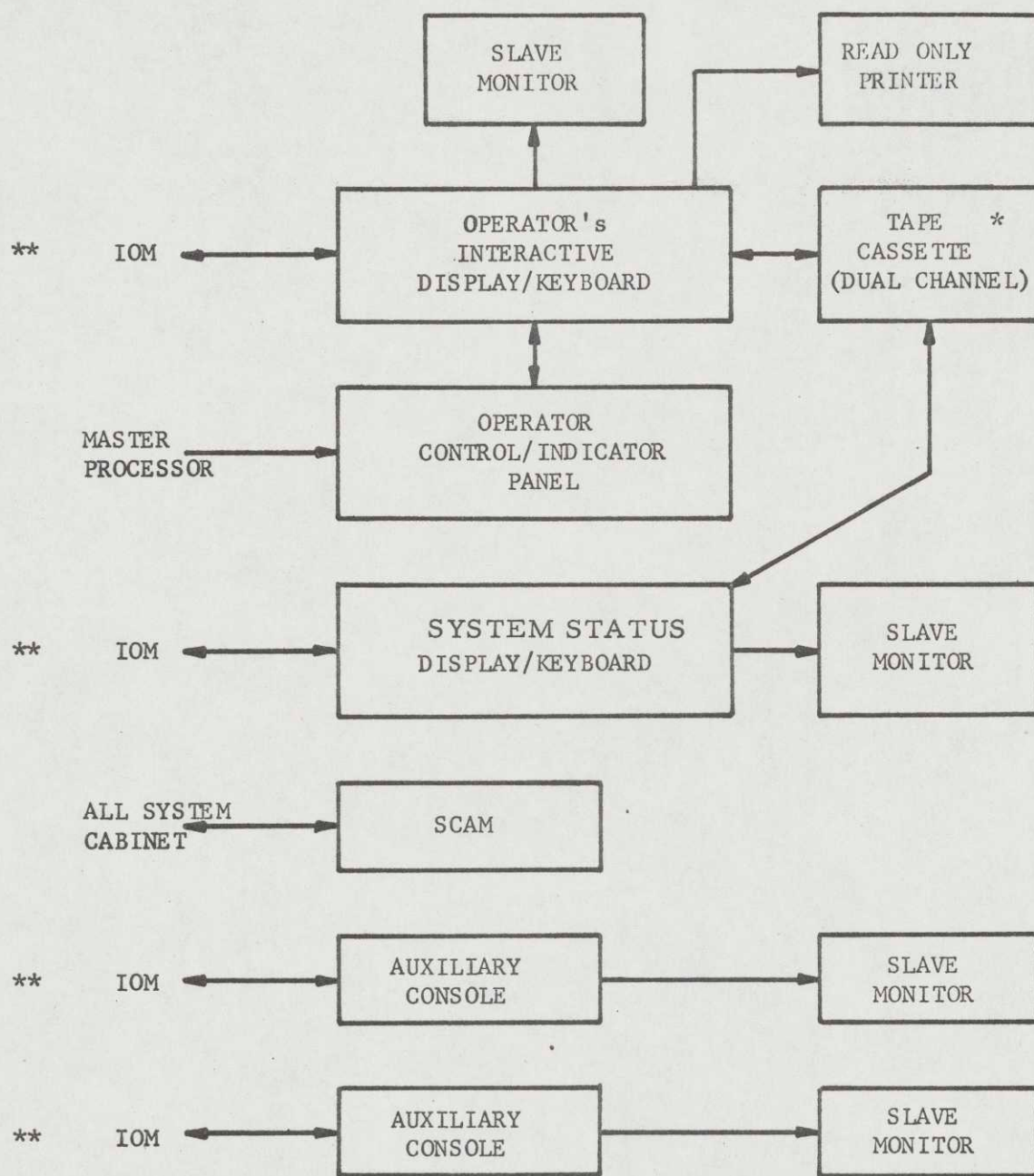


FIGURE 2.5 - SYSTEM CONTROL CENTER MAXIMUM CONFIGURATION

2.3

CONSOLE CONFIGURATION (continued)

All display devices, System Status Display, Interactive Console and Auxiliary Consoles, will provide a composite video output capable of driving a slave monitor display via a 1000 ft. cable.

The system/console and auxiliary console interface shall be capable of driving up to a 150-foot cable.

2.4

INTERFACE REQUIREMENTS

The interface presented to the IOM Console Channel Adapter will be a special interface. This interface will be optimized to satisfy the special requirements in interfacing the console devices to the H-6000 IOM for minimum software impact. Figure 2.6 depicts the signal requirements for the console interface. The auxiliary console will not contain an operator's panel as such; therefore, those signals going to and from the control panel will not be utilized for auxiliary consoles.

The drive capability of the signals on the console interface shall be 150 feet minimum.

2.4.1 Interface Description

A functional description of the console interface signals are contained in the following paragraphs.

Control Data - This line, when true will indicate to the display device that the character code received from the system is an eight-bit code. This line will always be false in the H-6000 system indicating that all data is a seven-bit ASC II code.

Transmit Data - Data will be transmitted from the system to the console bit serially in synchronization with bit timing and character synchronous pulses supplied by the console.

Receive Data - The system will accept bit serial data from the console on this line. The data will be in sync with the bit timing and character sync pulses from the console.

2.4.1 Interface Description (continued)

Console Ready - This line, when true, will indicate to the system that the console is on-line and capable of data transfer. A thin line remains true except when power is removed from the display device or the device is placed in Local mode.

Bit Clock - This signal will control bit synchronization for data transfer between the console and the system in both directions.

Read - This line will control the transmit mode of the console. This line must be true before any data will be accepted from the console by the system. The system will control the setting and re-setting of this function.

Write - This line will control the received mode of the console. This line must be true before the console will accept data from the system. The system will control the setting and re-setting of this function.

Acknowledge - This line will indicate that an acceptable character was received by the console following the transmittal of a character sync pulse.

Print - This line, when true, indicates that the data being transmitted by the system is to be printed as well as displayed on the CRT. The print mode switch on the indicator/control panel will be ORed with this line i. e. the on state of this line or the print switch will direct the message to the printer.

Operator Attention - This line, when true, shall activate an audible alarm in the console. Activation of this alarm shall not depend on the console ready line being true.

Attention Re-Set - Activation of this line will re-set the Operator Attention Alarm. Any signal on this line when the Operator Attention Alarm is not on will have no effect.

Operator Request - Activation of this line will signal the system that the operator desires to transmit to the system. This line will have no meaning if the Read line is true.

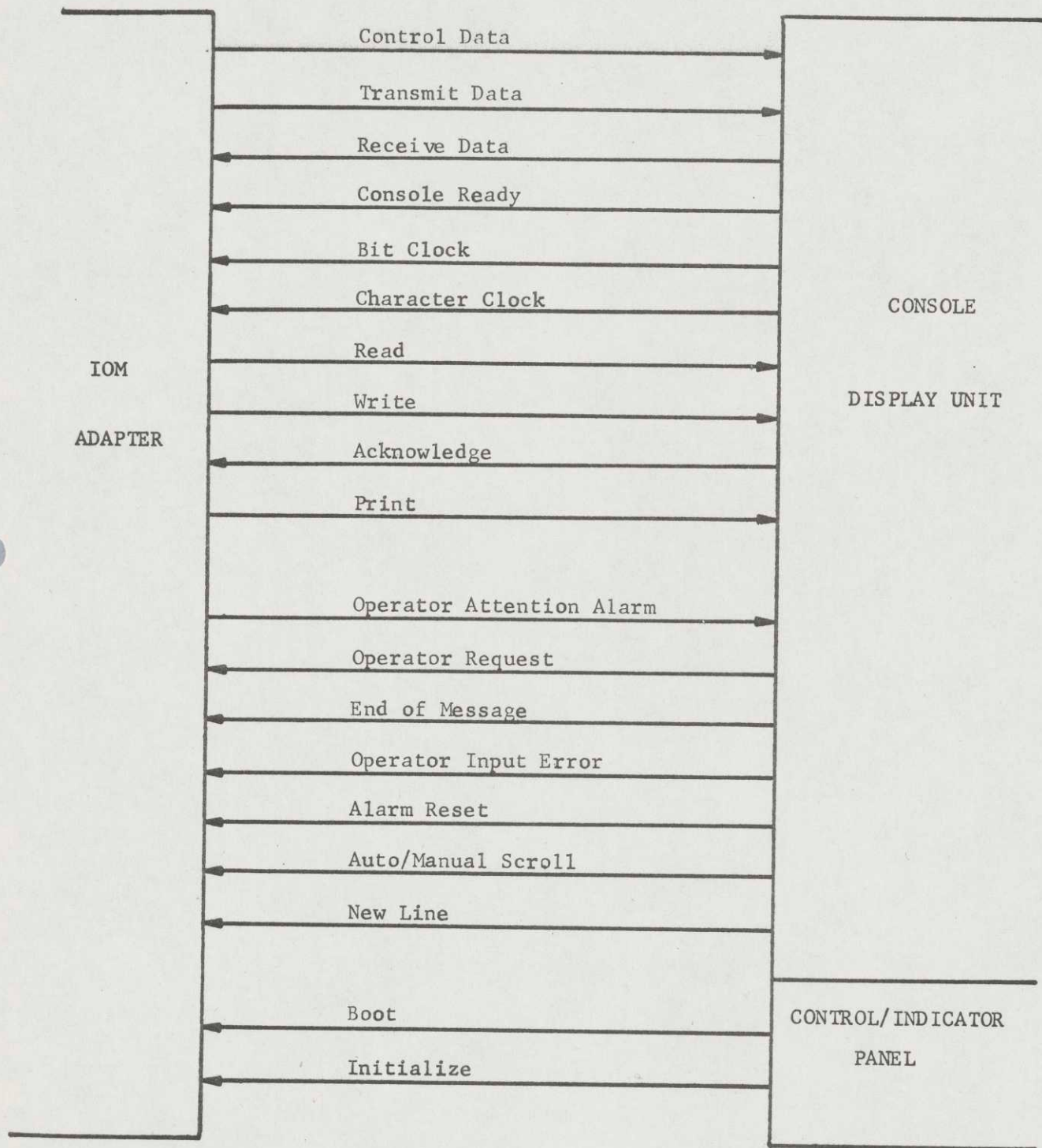


FIGURE 2.6

2.4.1 Interface Description (continued)

End of Message - This line, when activated, will indicate to the system that the current transmission to the system is completed. This line will have meaning only when the Read line is true.

Operator Input Error - This line, when activated, will indicate to the system that the current transmission contains an error, and any previous data transmitted is to be ignored so that the message can be re-started. This line will have meaning only when the Read line is true.

Message Mode - This line, when true, will indicate to the system that the console display is full and the operator is placing message transmission in a manual mode.

New Line - This line will have meaning only when the transmit data line is true and the display device is in the Line mode. When the above two conditions exist, activation of this line will indicate to the system that the console is ready to accept an additional line of data.

Boot - Activation of this line by the console will cause a system bootload procedure to be initiated.

Initialize - Activation of this line will cause the execution of a system initialization. Additional signals that will interface with the Operator's Control/Indicator Panel are:

- Instruction Execution Rate
- DIS Mode
- Processor Ready
- Store Ready

The indicators driven by these lines are defined in section 2.1.3. These signals will not be contained in the system/console interface cable, but will be communicated to the SCC via a second cable to the system processors.

2.5

OPERATIONAL REQUIREMENTS

The display devices on the System Control Center shall be capable of operating at a data rate of 600 Characters per second (CPS).

2.5

OPERATIONAL REQUIREMENTS (continued)

The data rate shall be selectable for 30, 40, 120 or 600 CPS. When a monitor printer is connected at a lower transfer rate the control electronics in the display device shall provide the necessary time delays for line feed and carriage returns.

Any failure or alert condition of the monitoring devices (printer and/or tape cassette) shall be visible displayed for operator attention, but shall not be reflected to the operating system.

Data transfer between the console and the system will be accomplished in a bit serial, asynchronous, start/stop mode. The character coding will be a seven-bit code, defined in section 2.1.5, plus one-bit odd parity. The data synchronization signals will be generated by the console display devices and transmitted to the system over the interface lines. The operator's keyboard will be inhibited when on-line except when the system activates the Read Line on the console/system interface. This line will be activated by the console IOM channel in response to a Read Command from the operating system.

During data transfer to the console, should the system be incapable of maintaining the data transfer at the character rate required by the display device, a null character (0000000) will be transmitted until the data character (s) can be processed and transmitted.

When the system outputs a message requiring an operator reply, the operating system will put the console in the Read Mode, allowing operator keyboard transmission. Operator keyboard inputs will appear as lower case characters on the printer, unless the shift key is depressed. The display device and the IOM channel will recognize the lower case characters as upper case. When the reply is completed the operator shall be required to terminate the message by depressing the End Of Message (EOM) button. There will be no end of message symbol displayed or printed. The IOM channel will acknowledge receipt of the EOM signal by terminating the console read mode and turning off the Read Mode indicator on the operator's panel. A carriage return is not required of the operator since all system output to the console will be preceded by a carriage return and line feed.

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2.5

OPERATIONAL REQUIREMENTS (continued)

Recovery from an incorrect reply or erroneously typed character shall be accomplished by depressing the Operator Error button. The system will respond to the Operator Error signal by terminating the transaction, and reissuing the console read command. The operator can then enter the correct message. If an EOM signal is transmitted before an incorrect reply is detected the incorrect message will be accepted by the system if it is one of the acceptable replies. It is to be noted that the edit capabilities of the display device can not be used to correct a keyboard input error. A character will be transmitted to the system as the key is depressed and the only means of recovering from an erroneous keyboard input is by notifying the system by activation of the Operator Error button instead of the EOM button.

When the system places the console in the Read Mode a thirty second timer will be activated in the console channel. The timer will be reset whenever a character is received from the console. Should the thirty seconds elapse without a response from the console the Read Command will be terminated by the console channel.

If the Message Mode Switch is in the line position and a new line is not requested within thirty seconds and the console channel has an outstanding transaction the operator attention alarm will be activated by the console channel.

3.0

SYSTEM CONTROL AND MONITORING (SCAM)

The SCAM subsystem shall provide a convenient centralized means of controlling and monitoring selected system functions.

The signals used for the SCAM functions shall be cabinet oriented signals as opposed to port or channel oriented. That is, the SCAM signals shall control and reflect the status of the cabinet as a whole - for example power on/off, initialization, temperature, etc. Further, SCAM shall have the flexibility of reconfiguration. Should it be desirable to remove a module (cabinet) from the system configuration, the SCAM reconfiguration shall be possible without requiring a physical change in the SCAM cable.

It is most important that the implementation of the SCAM functions provide maximum flexibility for product growth. It must be realized that the initial requirements are to fulfill a need to provide a centralized control and monitoring of the H-6000 system. The functional requirements of the SCAM unit are aimed at the needs for the total H-6000 line.

An objective of the SCAM design is to provide the basic requirements for the total H-6000 line with the necessary flexibility that will accommodate the addition of features desirable in large system and multiple system environments.

It is not difficult to envision additional functions that are desirable to include in the SCAM unit for the upper end of the H-6000 line and particularly for those sites that will have multiple systems.

A function presently being considered that could be implemented in the SCAM unit is centralized reconfiguration control of the H-6000 system. This could be a single switch on the SCAM panel that would enable access to configuration registers by the operating system or could provide manual entry of configuration data from the SCAM panel. Additional consideration and discussion is needed on this subject concerning need and implementation cost by Marketing, Hardware, Software and System Engineering before this consideration can become a requirement.

It is conceivable that the basic SCAM concepts can evolve into a computer facility control center. In a multiple computer facility operating in a 3-D environment with fluctuating loads it would be necessary to exercise control of system loading within the computer facility in order to realize maximum efficiency. Load balancing of such a facility could be provided by a centralized control center. Such a control Center would monitor the system resources of each

3.0

SYSTEM CONTROL AND MONITORING (SCAM) (continued)

system, monitor and control each cabinet of the facility and provide the facility operator the capability of directing jobs to the system best capable of meeting priority demands, and controlling the assignment of peripheral subsystems to meet the I/O requirements as the needs develop.

3.1

SCAM MODULES

The SCAM unit shall consist of a system control and display panel, control electronics, a cabinet module in each H-6000 system cabinet serviced by SCAM and the required cables for the SCAM system connections.

3.1.1 Display and Control Unit

The SCAM display and control panel shall be designed in a manner that it will enhance the appearance of the System Control Center and have the appearance of being a physical part of the control center. It is desirable that the design allow for the installation of the SCAM display and control unit with the present 635 console.

The SCAM system control panel is depicted in Figure 3.0. The figure is included for descriptive purposes only and not intended to specify a physical design. The functions of the System Control Panel require infrequent access by the operator, and like the group one functions of section 2.1.3, should be mounted in the same or similar manner.

It is to be noted that when the SCAM unit is added to the System Control Center the Initialize and Boot Load functions become a part of the SCAM unit. The Initialize and Boot Load functions will be altered as follows:

System Initialize - The Initialize function will be removed from the IOM interface and added to the SCAM system interface. The capability of monitoring execution and initializing a single cabinet will be added by the SCAM unit, as defined in section 3.5.

3.1.1 Display and Control Unit (continued)

System Boot - The boot function will be removed from the IOM interface and added to the SCAM system interface. The execution of the system boot will not be altered by the SCAM unit, but will be monitored and a cabinet failing to complete the boot sequence will be indicated on the SCAM Cabinet Monitor Panel.

A summary of the SCAM controls/indicators are contained in Table 1. The operational definition of the SCAM functions is contained in section 3.5.

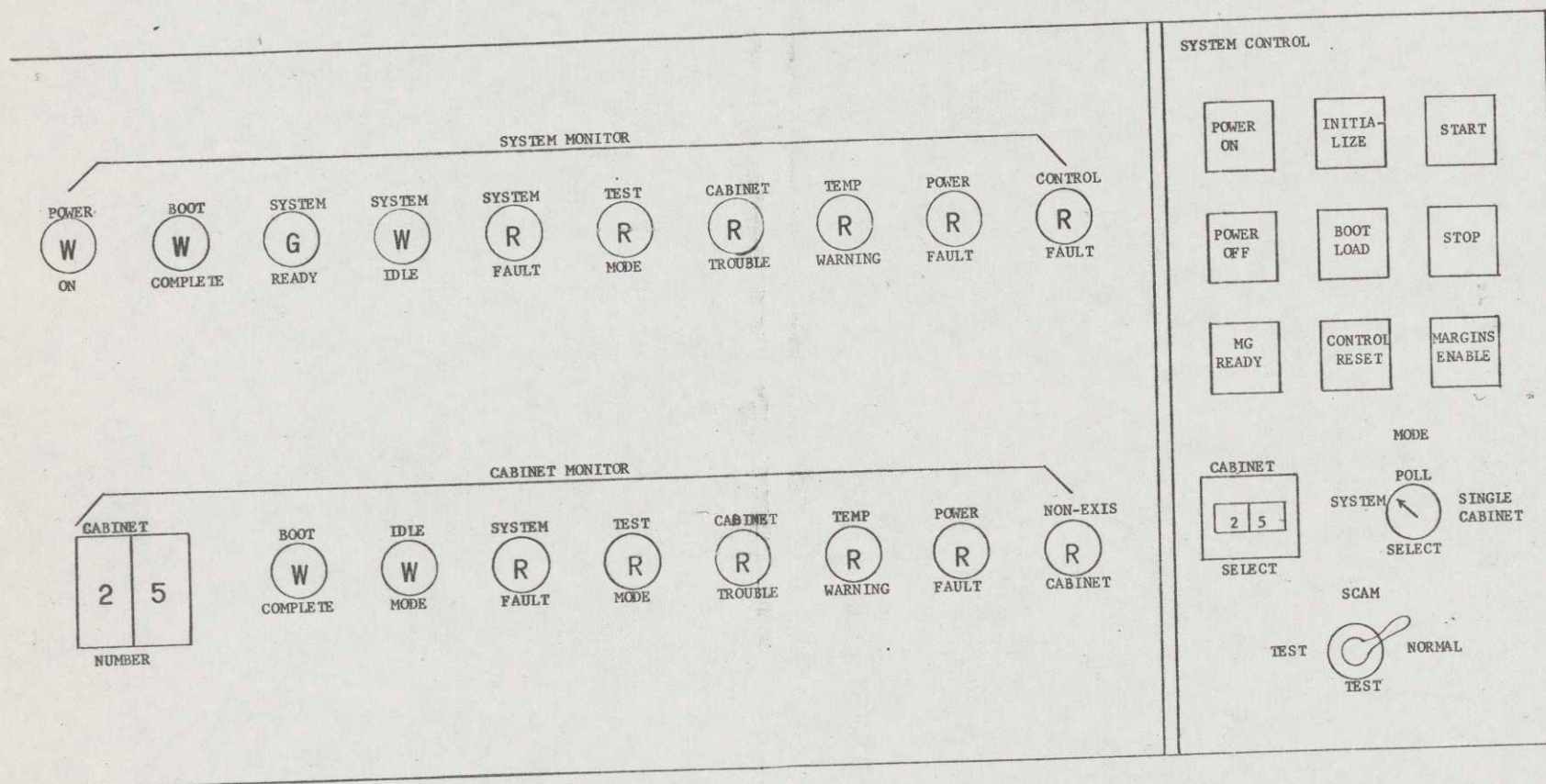


FIGURE 3.0
SCAM DISPLAY AND CONTROL PANEL

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TABLE 1

NAME	TYPE	LENS COLOR	FUNCTION
System Monitor			
Power On	indic.	White	Indicates the system power status.
Boot Complete	Indic.	White	Indicates that all cabinets involved in Boot function completed their sequence.
System Ready	indic.	Green	Indicates that all cabinets assigned to the system are in a ready state.
System Idle	indic.	White	Indicates that all configured cabinets are in the idle state.
System Fault	indic.	Red	Indicates that a fault in the system fault register has not been re-set within 16 milliseconds.
Test Mode	indic.	Red	Indicates that one or more cabinets are in the test mode.
Cabinet Trouble	indic.	Red	Indicates that one or more cabinets are in a trouble state.
Temp. Warning	indic.	Red	Indicates that one or more cabinets is operating above normal temperature.
Power Fault	indic.	Red	Indicates that one or more cabinets is not in the expected ON or OFF condition.
Control Fault	indic.	Red	Indicates that confidence is lost in one or more cabinets.
Cabinet Monitor			
Cabinet Number	indic.		Identifies the cabinet whose status is displayed.

TABLE 1 (continued)

NAME	TYPE	LENS COLOR	FUNCTION
Cabinet Monitor (continued)			
Non-exist. Cab.	indic.	Red	Indicates that the cabinet selected is not configured in the system.
Boot Complete	indic.	White	Indicates that the selected cabinet has completed the boot sequence.
Idle Mode	indic.	White	Indicates that the selected cabinet is in the idle state.
System Fault	indic.	Red	Same as system monitor, but cabinet will be identified.
Test Mode	indic.	Red	Indicates that the selected cabinet is in the test mode.
Cabinet Trouble	indic.	Red	Same as system monitor, but cabinet will be identified.
Temp. Warning	indic.	Red	Same as system monitor, but cabinet will be identified.
Power Fault	indic.	Red	Same as system monitor, but cabinet will be identified.
System Control			
Power-ON	sw/indic.	.	Applies power to the cabinets at a rate of one cabinet per second or to a single cabinet depending on the position of mode select switch.
Power-OFF	sw/indic.		Removes power from all cabinets at a rate of one cabinet per second, or a single cabinet depending on the position of the mode select switch.

TABLE 1 (continued)

NAME	TYPE	LENS COLOR	FUNCTION
System Control (continued)			
Initialize	sw/indic.		Initialize all cabinets in the system or a single cabinet depending on the position of the mode select switch.
Boot	sw/indic.		Initializes system and executes bootload command to cabinets involved in bootload sequence.
Start	sw/indic.		Transmits start-up fault to processor(s).
Stop	sw/indic.		Transmits shut-down fault to processor(s).
MG Ready	indic.		Indicates that the MG set output is ready for operation.
Control Re-set	switch		Should any of the System Control indicators hang in the ON state, the command sequence can be re-set by this switch so that the command can be re-issued.
Margins Enable	sw/indic.		Enables programmable test margins in all cabinets.
Cabinet Select	sw/indic.		Manual selection of a single cabinet for control or cabinet monitoring. This switch is enabled only when the Mode Select switch is in the Single Cabinet position.
Mode Select	switch		Selects the desired operating mode of the SCAM unit.
SCAM Test	switch		Selects the normal operation of the SCAM unit or a self testing mode of the SCAM subsystem.

3.1.2 Control Electronics

The SCAM shall contain the necessary control electronics to provide the control, monitoring and operational requirements as defined in this document. Further, the control electronics shall contain self confidencing and error isolation where ever practical.

3.1.3 SCAM Cabinet Modules

The SCAM cabinet modules shall be designed to require a minimum amount of rework to the cabinet in which it is installed. A standard mechanical and electrical design shall be established for the SCAM cabinet modules, so that all system cabinets are serviced by identical SCAM modules. Cabinet modules shall be mounted in the following H6000 Line System Cabinets:

- H6000 Processor
- H6000 System Controller
- H6000 IOM
- H6000 Core Controller
- 355 Mainframe
- 355 High Speed Line Adapter
- 355 Low Speed Line Adapter
- Microprogrammed Peripheral Controller
- Bulk Store Controller

Each cabinet module shall contain a removable six bit ID plug which will identify the cabinet to the SCAM system bus. When the control unit selects a cabinet by sending a cabinet number over the common bus, the number will be compared with the ID plug. If the numbers compare, the cabinet status and response lines will be enabled to the SCAM system bus, or the command signal will be enabled to the respective cabinet module.

3.1.4 Cable

The SCAM system cable shall be a daisy-chained bus. That is, the bus will be made up of cable segments, continuity of the bus will be maintained by jumpering the I/O plugs in the SCAM cabinet module. The bus continuity shall not depend on the cabinet being powered up. The sum of all cable segments (from SCAM control panel to last physical cabinet) shall not exceed 1600 feet.

3.2

SCAM SYSTEM CONFIGURATION

There shall be no restriction on the physical or logical order in which the system cabinets are connected to the SCAM bus. That is, the physical order shall not be required to correspond to the logical order of the ID plugs. Further, the ID numbering scheme shall not be required to be continuous. The only restriction placed on the cabinet ID numbering scheme is that cabinet number zero is reserved for the SCC.

Each cabinet module shall provide a pair of I/O connectors, enabling the SCAM to be configured in an environment of systems. One connector in each pair for input and the other for output. Corresponding pins shall be jumped together to pass the system buses through the SCAM Module.

Each SCAM cabinet module shall have a "System Configuration Panel". This panel shall contain either four or eight toggle switches depending on the type cabinet it is mounted in. The system CPU, SC and IOM shall require the configuration panels with eight switches, all other cabinets shall use the panels with four switches. The switches shall be arranged in two groups of four switches each. One group shall be for the assignment of the cabinet to any of four possible systems. All cabinets shall contain this group of configuration switches. The other group shall designate the system boot control. This group of switches shall be included on the CPU, SC and IOM SCAM cabinet modules only. The cabinet module configuration panel is depicted in Figure 3.1.

A cabinet shall be configured in a given system(s) by switching the appropriate "system configuration" switches on the cabinet SCAM module configuration panel. The four "configuration switches" representing systems 1 to 4 respectively shall allow the selection of three conditions: (1) Off, cabinet not configured on the indicated system, (2) Monitor Only, control capability not allowed on the indicated system, (3) Control and Monitor, complete SCAM capability on the indicated system. This configuration control will allow a given cabinet to be configured on more than one SCAM system.

For example, Figure 3.2 depicts a SCAM connection to two independent systems. The four lines shown represent the configuration lines in four separate cables. An "X" on the line indicates that the respective cabinet configuration switch is in the "control and monitor" position. An "O" on the line indicates that the cabinet is configured on the respective SCAM unit for monitor only capability. Although not shown in Figure 3.2, a cabinet could be configured for "monitor and control" from both SCAM units.

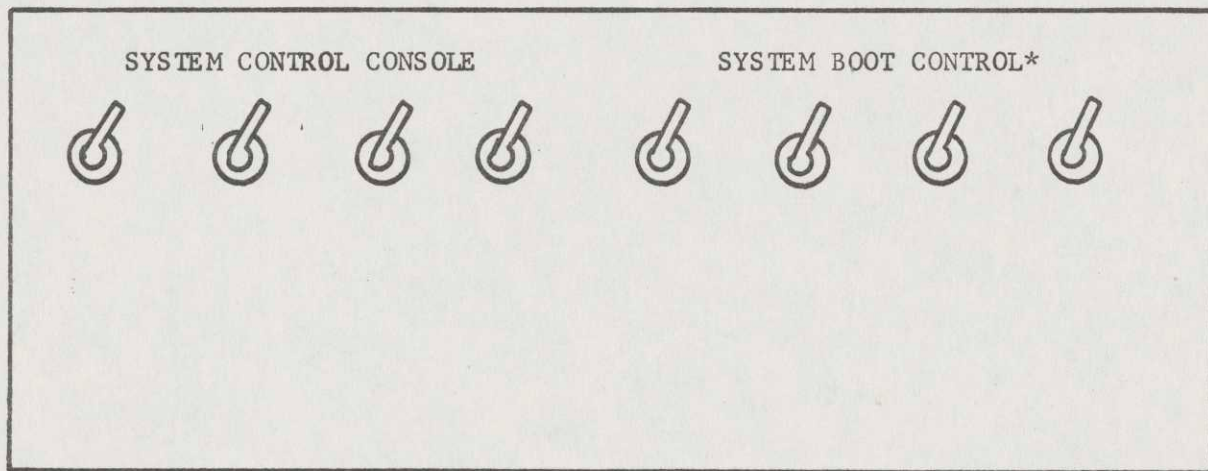


FIGURE 3.1 - SCAM CONFIGURATION PANEL

* The four System Boot Control switches are required on the CPU, SC and IOM only.

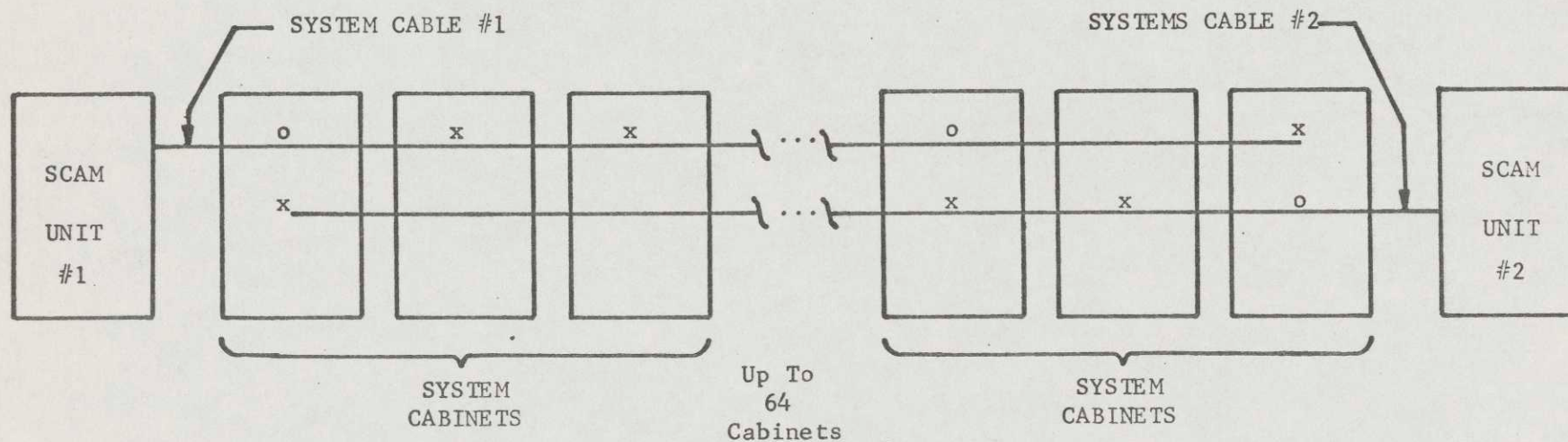


FIGURE 3.2 - SCAM SYSTEM CONFIGURATION

3.2 SCAM SYSTEM CONFIGURATION (continued)

The SCAM subsystem shall be modularly designed to accommodate system growth. That is, in a single system environment the SCAM subsystem will contain only those components required to support a single system with the capability of adding the required cables and components to support multiple systems as the need requires.

3.3 INTERFACE REQUIREMENTS

The SCAM shall interface with each individual H6000 system cabinet. An exception to this will be the peripheral devices and the system console. The Microprogrammed Peripheral Controller and Bulk Store Controller will interface with the SCAM, but monitoring and confidencing of the devices will be left to the operating system.

The SCAM cabinet module shall be standard for all cabinets, and the I/O pin designation shall be the same. If a given signal is not utilized in a given cabinet, then the cabinet harness in that cabinet will provide the proper tie off if necessary.

3.3.1 Interface Description

Table 2 lists the signals that shall be made available to the SCAM module for each of the H6000 system cabinets. Figure 3.3 shows the SCAM system bus and the interface signals to the cabinet components. These figures represent present implementation plans and are not intended to impose restrictions on final implementation.

3.4 OPERATIONAL REQUIREMENTS

The SCAM unit will provide system control for sequencing power up or down, initializing, start up and shutdown fault interrupts and boot loading. In addition to these system controls, the power ON/OFF and initialize functions will be addressable to an individual cabinet when the mode switch is in the single cabinet mode. Indicators will display a command in progress and its completion.

The system monitor will maintain a constant surveillance of the total system for faults such as power, temperature, system error, cabinet trouble, etc. A detected fault will result in the alarm being sounded and the fault displayed on the SCAM panel.

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	PROCESSOR	SYSTEM CONTROLLER	IOM	CORE CONTROLLER	355 CPU	355 HSLA	355 LSIA	MPC	BULK STORE CONTROLLER
Inputs to Cabinets Logic {	SHUT DOWN FAULT	X			X			X	X
	START UP FAULT	X			X			X	X
	INITIALIZE	X	X	X	X	X	X	X	X
	BOOT LOAD	X	X	X					
	MARGINS ENABLE	X	X	X	X	X	X	X	X
Outputs from Cabinet Logic {	IDLE	X	X	X	X	X	X	X	X
	BOOT COMPL.	X	X	X					
	CABINET T/N SW.	X	X	X	X	X	X	X	X
	SYSTEM ERROR	X							
SCAM Configuration Panel {	SYSTEM BOOT CONT	X	X	X					
	SYSTEM CONT.	X	X	X	X	X	X	X	X
Input to CARE Package {	POWER ON	X	X	X	X	X	X	X	X
	POWER OFF	X	X	X	X	X	X	X	X
Output From CARE Package {	TEMP. WARNING	X	X	X	X	X	X	X	X
	+24 VDC	X	X	X	X	X	X	X	X
	RETURN	X	X	X	X	X	X	X	X
	POWER	X	X	X	X	X	X	X	X
POWER SUPPLY {	Input — CONSOLE T/N SW.	X	X	X	X	X	X	X	X
	Output — MARGINS ENABLE	X	X	X	X	X	X	X	X
	PS CONFIDENCE	X	X	X	X	X	X	X	X
Operator Panel Output {	CABINET TROUBLE	X	X	X	X	X	X	X	X

TABLE 2
INTERFACE SIGNALS

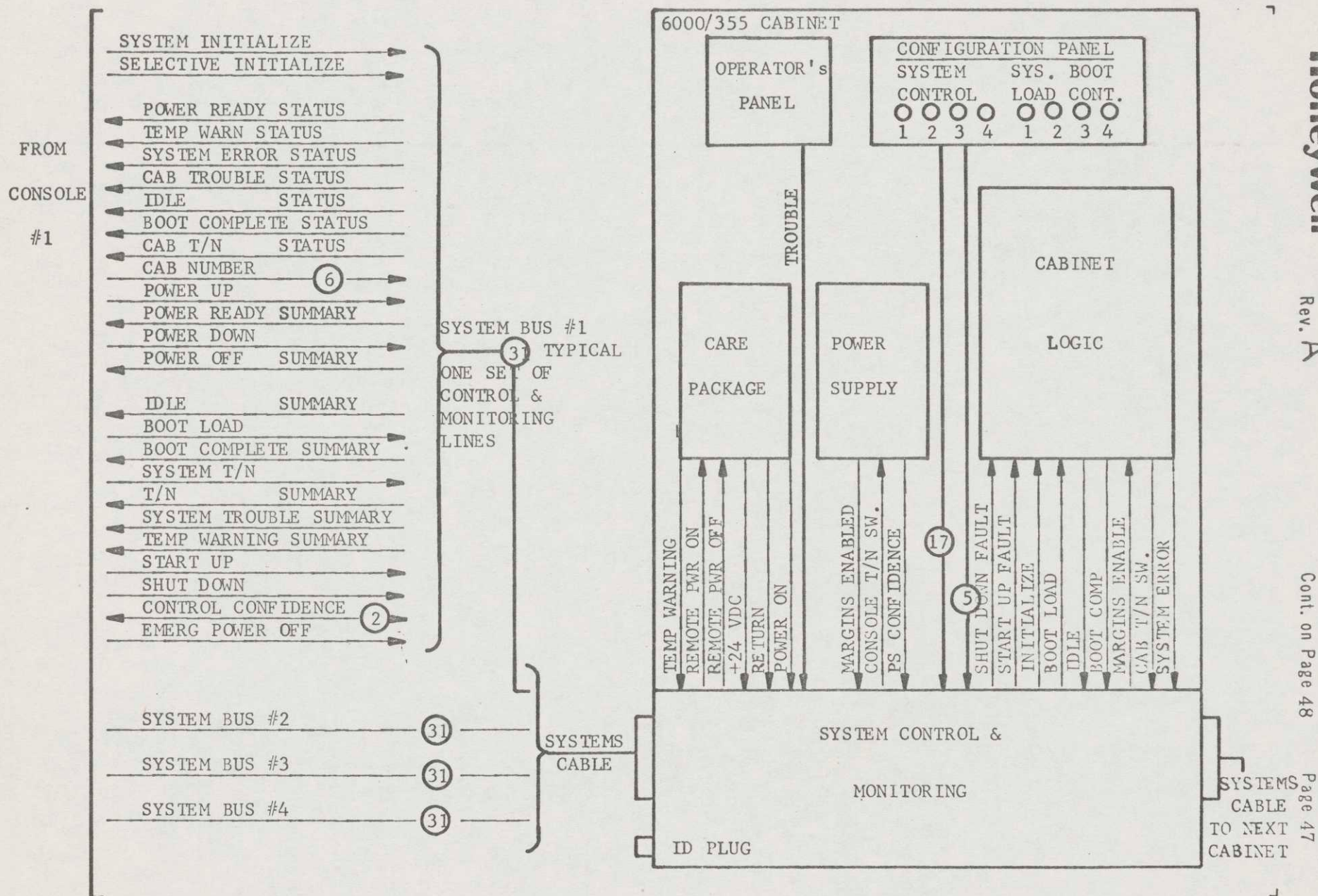


FIGURE 3.3

3.4 OPERATIONAL REQUIREMENTS (continued)

A cabinet monitor shall provide an independent surveillance of the individual cabinets one at a time. The cabinet monitor shall have three operating modes: (1) single cabinet, (2) system and (3) poll. The operating modes of the cabinet monitor are described in the following paragraphs.

3.4.1 System Mode

In the system mode the SCAM unit shall automatically select each system cabinet. The continuous sequence will be maintained by incrementing the cabinet number register each time a cabinet status is examined. When the incrementation reaches the highest number, the cabinet number register shall be reset to one and the sequence continues.

In the system mode the execution of the system control functions which use cabinet sequence control (power ON/OFF) shall have priority. When the operator initiates a control function, the cabinet monitoring will be halted if in the system mode, and the cabinet number register reset to one and the control function executed. When the control function has been executed to the highest numbered cabinet, the cabinet number register will be reset to one and the cabinet monitoring continued. If a fault condition is detected, the cabinet number and status will be displayed on the display and control panel, and the monitoring sequence will pause for one second. Following the one second pause, the cabinet indicators will be turned off and the monitoring sequence will be continued. The cabinet number and fault status will flash on for one second for each cabinet with a fault until the condition is corrected or another operating mode is selected.

3.4.2 Single Cabinet Mode

The single cabinet mode on the cabinet status panel shall result in the status of the cabinet, manually set in the cabinet select switches, being continually displayed. This will inhibit the continuous cabinets surveillance of the system. The SCAM subsystem summary shall continue to monitor the system, should a fault be detected in a cabinet other than the cabinet identified in the cabinet select switch, the status will be displayed on the system monitor display without disturbing the cabinet monitor display. When a control function is executed in the single cabinet mode, the cabinet select switch is read and the control function executed.

3.4.3 Poll Mode

The poll mode is similar in operation to the System Mode, the difference being the cabinet monitor will pause for one second and display the cabinet number and status of every cabinet configured in the system (system mode displays only cabinets with faults). This provides a means of visually verifying the cabinet identification numbers that are configured in the system. This mode will automatically be selected by the SCAM unit when power is being applied to the system.

3.5 OPERATIONAL DEFINITION

The SCAM operational interface shall be divided into three functional sections (1) System Control, (2) System Monitor and (3) Cabinet Monitor. The functional separation is depicted in Figure 3.0. Although the figure is not intended to specify a given panel design, the functional grouping is a requirement.

The functional requirements of the operational interface are defined in this section.

3.5.1 System Control

The System Control Section of the SCAM subsystem shall provide the operator the capability of executing SCAM command sequences to the system or to selected cabinets if the single cabinet mode is selected. The controls on the System Control Panel shall indicate that the specified function has been activated by illuminating the respective control switches. An indication that the sequence for the specified function has been completed will be indicated by turning off the respective switch/indicator. The controls and indicators to be provided on the System Control Section of the display and control panel are defined in the following paragraphs.

Power On:

This switch results in AC power being applied to the system cabinets or to selected cabinets depending on the state of the Mode Select Switch. When depressed, this button will be illuminated indicating that the power on function has been activated. The button will remain illuminated until execution of the power on sequence has been completed.

3.5.1 System Control (continued)

POWER ON: (continued)

When the power on sequence is initiated the SCAM unit will automatically change its cabinet selection rate to one cabinet per second. The cabinet identification register will be reset to one and a power on signal sent to each cabinet configured in the system. In this sequence the SCAM unit increments the cabinet number register once per second and issues a power on signal, no power fault status is monitored during this sequence.

After the power on signal has been issued to the highest numbered cabinet assigned to the system, the Power ON button illumination will be turned off. The SCAM unit will then return to the normal search mode of operation. If any cabinet failed to turn on or later loses power, the power fault status will be set and the alarm sounded.

POWER OFF:

This switch shall result in AC power being removed from the system cabinets or a selected cabinet depending on the state of the Mode Select Switch. When depressed, the switch will be illuminated indicating that the power off function has been activated. The SCAM control unit will transmit a shutdown fault to the control processor and delay one second before the power off signal is sent to each of the system cabinets at a rate of one cabinet per second. After the power off signal has been transmitted to the last cabinet in the system the Power OFF button illumination will be turned off. The System Monitor will report any cabinet that failed to turn power off.

INITIALIZE

This switch shall result in all cabinets, or a selected cabinet of the system being initialized, depending on the state of the Mode Select Switch. When depressed this switch will be illuminated, indicating that the initialize function has been activated. The switch remains illuminated until an idle signal has been received from each cabinet in the system, or a specific cabinet if selective initialize is issued. The idle status following an initialize command will be interpreted as initialize complete and the initialize button illumination will be turned off.

3.5.1 System Control (continued)

BOOT

Activation of this switch shall result in the system being initialized and a Bootload being executed. This function is independent of the Mode Select Switch; that is, the bootload is always executed on a system basis and never to a single cabinet.

The configuration panel on the SCAM cabinet modules for the processor, system controller and IOM shall contain four boot enable switches, one for each of the four possible system buses. When the system is configured these switches must be set to the enable position for the cabinets assigned as bootload modules. When depressed, the boot switch and the initialize switch will be illuminated indicating that the initialize boot sequence is in progress. When the system responds to the command with the idle and boot complete signals, the switch illumination will be turned off in turn indicating the completion of the command sequence.

STOP

Activation of this switch shall result in a Shutdown Fault being sent to the system processor(s). When depressed, the switch will be illuminated indicating that the SCAM unit has activated the function. After the Shutdown signal has been transmitted and a system idle response is received the switch illumination will be turned off.

The SCAM control unit will monitor the primary AC power and automatically generate a shutdown interrupt to the system whenever a power failure is detected.

The present MG set (models 4WMG8030 through 8034) have the capability of maintaining voltage output 768 milliseconds after a loss of primary input power. Therefore, a power failure will be defined as the MG set "ride through" time, minus the time required for software shutdown fault processing.

Since the shutdown fault processing software is not yet available the time required for such a software function is not known. Therefore, the initial implementation of the shutdown interrupt may arbitrarily be set for a power interruption of 50% of the MG ride through time (384 milliseconds).

3.5.1 System Control (continued)

START

Activation of this function will result in a startup fault being sent to the system processor. When depressed, the switch will be illuminated, indicating that the function has been activated. Upon reception of system not idle the switch illumination will be turned off.

MG READY

The MG Ready is an indicator only with no switching function. The MG Ready signal is supplied by the motor generator control unit and indicates the MG is up to speed and ready to be loaded.

3.5.1 System Control (continued)**MARGINS ENABLE**

Depressing this switch shall result in enabling software to set marginal test conditions in all cabinets configured in the system. When the indicator is turned on, depressing the switch will turn off the indicator and the margins enable signal from the system. However, software could still have the capability of setting the test margins if the cabinet(s) are in the local test mode. That is, the SCAM Margins Enable shall not override the individual switches on the system cabinets.

CONTROL RESET

This switch shall be provided to enable the operator to reset the other control functions. If one of the other control switches was activated and failed to turn off, indicating that the system failed to respond to the function, it would be necessary to reset the control function before retrying the operation. The MG Ready Indicator and Margins Enable will not be affected by the Control Reset.

CABINET NUMBER SELECT

The Cabinet Select Switch shall provide the operator the capability of selecting a specific cabinet for status display and control function when the single cabinet mode is chosen. The number set into the cabinet select switch will have no significance unless the Mode Select Switch is in the single cabinet position

MODE SELECT SWITCH

This switch shall provide the operator the capability of selecting (1) Single Cabinet Mode, (2) System Mode or (3) Poll Mode. The mode select switch on the cabinet monitor section shall affect only the operation of the cabinet monitor functions and Power ON/OFF and initialize functions when in the single cabinet mode. The operating modes of the cabinet monitor functions are defined in Section 3.4.

3.5.1 System Control (continued)

SCAM TEST

This switch shall provide a self test for confidencing the SCAM subsystem. In the test mode with the SCAM subsystem in the Poll Mode (one cabinet per second selection rate) test signals will be issued to each cabinet. The test signal shall result in the cabinet responding with all status bits set on the cabinet monitor display. The failure of any status indicator on the cabinet monitor display to turn on will indicate a failure in the SCAM subsystem. The test mode of operation shall continue until the switch is returned to the normal position.

3.5.2 System Monitor

The system monitor section shall consist of indicators only. The indicators will reflect a summation of the status of all configured cabinets. That is, the system monitor will reflect the status of the system as a whole. An indication in the system monitor section will indicate that the status exist for one or more cabinets. The system monitor shall reflect the system status although the cabinet display is in the single cabinet mode. When a fault condition (red indicator) is detected in a cabinet the respective indicator will be illuminated on the system monitor display and the attention horn activated. The horn will continue to sound until the Alarm Reset is depressed. Should the same fault occur in a second cabinet before the first cabinet is corrected, or removed from the system, but after the alarm has been reset, the alarm will not be sounded but the cabinet display will flash the new cabinet number and fault condition (in the system mode). The system monitor indicators are defined in the following paragraphs.

POWER ON - The Power On Indicator displays the system power status (ON or OFF). This indicator is used in conjunction with the Power Fault Indicator to determine the type of power failure. (See Power Fault Indicator).

SYSTEM READY - This indicator when illuminated will indicate that all cabinets assigned to the system are in a ready condition. The Idle, Boot Complete and Power On indicators are the only other system monitor functions that can be activated with the System Ready indicator.

IDLE MODE - When illuminated, this indicator indicates that all cabinets assigned to the system are in the idle (non-processing) state. Following the activation of the System Initialize or Stop function, this indicator will indicate that the function was executed successfully.

3.5.2 System Monitor (continued)

SYSTEM FAULT - The system processor will signal the SCAM unit whenever one of the below listed faults are set in the processor fault register. Should the operating system fail to reset the fault within sixteen milliseconds the system fault would be activated and the alarm sounded

- a) Op Not Complete
- b) Lock-Up
- c) Parity
- d) Command
- e) Store
- f) Illegal Procedure
- g) Shut-Down

TEST MODE - When illuminated, this indicator will indicate that one or more cabinets have been put into the Test Mode by activation of the Margins Enable control on the SCAM panel or by the Test/Normal switch on the individual cabinets. If the indicator is illuminated as a result of a cabinet switch the fault alarm will also be activated. If the margins enable switch has been activated at the SCAM System Control Panel the indicator will be turned on, but the fault alarm will not be sounded. The System Ready Indicator will be turned off whenever the Test Mode Indicator is activated.

CABINET TROUBLE - This indicator is a monitor of the trouble indicator on each individual cabinet operator's panel. For a detailed definition of this indicator see the respective cabinet EPS. Activation of this indicator will also sound the attention alarm.

TEMPERATURE FAULT - When illuminated, indicates that one or more of the cabinets configured in the system is operating above normal temperature. Should the temperature of a cabinet increase to a preset value above normal operational temperature the Temp. Fault indicator will be illuminated and the alarm turned on. The alarm will continue to sound until the alarm reset is depressed.

POWER FAULT - When illuminated, this indicator indicates that a power fault exists in one or more cabinets of the system. A power fault will indicate either of two conditions: (a) System power status is "ON" but not all cabinets have power on. (b) System power status is "OFF" but not all cabinets have power off. The alarm will be turned on upon detection of a power fault.

3.5.2 System Monitor (continued)

CONTROL FAULT - When illuminated, indicates that the SCAM confidence is lost. This function monitors the +24VDC in each cabinet and maintains a cable continuity check. Should the +24VDC be lost in any cabinet, or the SCAM cable disconnected at any point this indicator will be illuminated, and the alarm sounded. The alarm will continue to sound until the alarm reset is depressed or the fault corrected

3.5.3 Cabinet Monitor

The cabinet monitor section of the SCAM panel reflects the individual cabinet status along with the cabinet identification number. The operating mode of the cabinet display will depend on the position of the Mode Select Switch, defined in section 3.4. The cabinet monitor section is defined in the following paragraphs.

CABINET NUMBER - Anytime a cabinet status is being displayed a unique two digit number will be illuminated identifying the cabinet whose status is being displayed. If the Mode Select Switch is in the System Mode this indicator will be illuminated only when a fault is detected in a cabinet. In the Single Cabinet Mode the selected cabinet number will remain illuminated until another cabinet is manually selected. In the Poll Mode, the identification of all cabinets assigned to the system will be displayed at a rate of approximately one cabinet per second.

NONEXISTENT CABINET - When illuminated, indicates that the number selected on the cabinet number select switch does not exist in the system configuration. This indicator will be activated only when the operator manually selects a single cabinet for display.

TEST MODE - This indicates that the indicated cabinet has been placed in the test mode, either from the SCAM display and control panel or at the individual cabinet maintenance panel, giving software the capability of setting marginal test conditions in the indicated cabinet or enabling the cabinet maintenance panel if put in Test Mode by the cabinet Test/Normal switch.

3.5.3

Cabinet Monitor (continued)

IDLE MODE - This indicates that the indicated cabinet is in the IDLE state.

BOOT COMPLETE - This indicator is applicable to the system cabinets involved in a bootload only. Should the system fail to complete a bootload, this indicator can be used to determine which cabinets have/have not completed the boot sequence.

TEMPERATURE FAULT - This indicator has the same meaning as the Temp. Fault in the system monitor, except that the cabinet is identified with the fault.

POWER FAULT - This indicator has the same meaning as the Power Fault in the system monitor, except that the cabinet is identified with the fault.

SYSTEM FAULT - This indicator has the same meaning as the System Fault in the system monitor, except that the cabinet is identified with the Fault.

CABINET TROUBLE - This indicator has the same meaning as the cabinet trouble indicator in the system monitor, except that the cabinet is identified with the Fault.

4.0

SOFTWARE REQUIREMENTS

This section is added for the purpose of discussing known areas where software support is required or desired.

The initial implementation of the hardware is to provide an interface that will be software compatible with the present common peripheral console. It is intended that a second phase of the SCC development will include software that will more fully utilize the CRT characteristics and provide efficient system operation without an on-line console printer.

4.1

SOFTWARE INTERFACE

Insofar as possible the IOM interface of the console channel will be software compatible with the 655 Common Peripheral Console. A difference in the two interfaces that exist, but have no foreseeable software impact is that the console channel will ignore bits 23 through 35 of the PCW. The Common Peripheral Channel

4.1 SOFTWARE INTERFACE (continued)

interprets these bits as Mark, Channel Instruction and Record Tally.

The capability will be provided so that software can specify 635, 6-bit or ASC II, 7-bit data character codes for Write Operations. All data received from the console will be converted and transferred to the IOM in the 635 6-bit code by the Channel Adapter.

The Console Channel Adapter is defined in the respective EPS-1 reference in section 1.6.

4.2 SYSTEM STATUS

The purpose of the System Status Display is to relieve console traffic and present system status and reports in a convenient page format. The hardware implementation and software interface of the System Status Display will be identical to the interactive console display. The System Status Display will, in fact, be one of the four possible system consoles.

The functional description of the System Status Display contained in this section is essentially the same as the software defined in Design Memo #275. A major difference is that the System Status Display will be a console display device and interface the system via an IOM Console Channel Adapter defined in EPS-1, referenced in section 1.6. In general, the functional description of this section are excerpts from the above referenced design memo, and are included here in order to establish a common understanding and a working base for the SCC System Status Display implementation.

4.2.1 Standard Image

The standard image of the System Status Display provides a comprehensive display of system and job status.

For descriptive purposes the information is grouped into six lists. It is not intended that this "grouping" be interpreted as a requirement of display format. The information to be displayed on the standard image shall include, but not be limited to the following:

4.2.1 Standard Image (continued)

a. Waiting Stack

This list shall contain all jobs that are waiting to go into execution. The jobs shall be identified by SNUMB and current activity number along with a status code specifying the reason the job is waiting.

b. Executing Stack

This list shall contain all jobs that are in execution or swapped out of core. The jobs shall be identified by SNUMB number and if applicable a code designating that the job is currently "swapped out" or in termination.

c. Systout Stack

This list shall contain all jobs that are waiting to be processed by GEOT. The jobs will be identified by SNUMB number and a code indicating the following:

1. Printer Output is waiting
2. Punch output is waiting
3. Printer and/or punch output is in process
4. Remote output waiting or in process

d. Remote Stack

This list shall contain the identification and status of all lines currently connected to the system.

e. Peripherals

This list shall contain the identification and status of all unit record and tape peripherals. The status to be reported with the device identification shall include:

1. Device free
2. Device allocated (job identification)
3. Device released
4. Device free, but dedicated
5. Device is system accounting collector

4.2.1 Standard Image (continued)

e. Peripherals (continued)

If there are more entries than can be displayed in any of the above five listed, the last entry of the appropriate list will be "MORE" and the next update of the display will pick up where the previous one went full.

f. System Summary

The System Summary will contain a fixed number of entries and will never "overflow". The System Summary section shall include the following entries:

1. Core

- (a) Amount of core available for allocation
- (b) Largest single contiguous block available for allocation, 1 K blocks

2. Jobs

- (a) Total number of batch jobs run since boot or "HISTRE"
- (b) Total number of remote jobs run since boot or "HISTRE"

3. Time Sharing Subsystem (TSS)

- (a) Current number of TSS users
- (b) Current size of TSS, 1K blocks
- (c) Indication if TSS is swapped out
- (d) Indication if TSS is not in execution

4. Tape

- (a) Total number of tape handlers available for allocation

4.2.1 Standard Image (continued)

f. System Summary (continued)

5. Sysout

(a) Total number of available sysout blinks

6. Disc, Drum, Mass Store

(a) Current number of links available on each type of random storage.

4.2.2 Options

In addition to the above display the operator shall have the capability of requesting specific information and specifying the update interval time of the standard image.

In order to gain access to the option mode, the operator must depress the request button on the System Status Display. The system will respond by clearing the screen, displaying the current update interval time and requestion "OPTION" input. The keyboard will then be enabled and the channel placed in the read mode.

The operator input options shall include the following:

- | | |
|------------|--|
| a. Option: | Request a list of valid options. |
| Function: | Causes a list of all legal options to be displayed on the System Status Display. The list will be terminated by the system requesting another "OPTION ?" and placing the channel in the Read Mode. An EOM signal with no option input will result in the system returning to the standard image display. |
| b. Option: | Change update interval. |
| Function: | Specifies the update interval, in seconds, of the standard image display. The update interval can have a value from 1 to 63. An input of zero or any number greater than 63 will be interpreted as 63 seconds. The system will return to the standard image display with the new update interval when this option is terminated. |

4.2.2 Options (continued)

- c. Option: Switch Channel
Function: Terminate system status and direct console traffic to the System Status Display Channel.
- d. Option: List system status on console.
Function: Automatically execute a "HIST" output to the system console every hour.
- e. Option: Stop automatic "HIST"
Function: Discontinue the automatic execution of "HIST" output to the system console.
- f. Option: Display time sharing users
Function: List all time sharing user identification and station identification currently connected to the system. This image will be updated at the same interval as the standard screen image and remain until an operator request signal is received by the system and the option mode entered.

4.3 START-UP/SHUT-DOWN FAULT PROCESSING

The SCAM control unit will monitor the primary AC power and automatically generate a shut-down interrupt to the system processor(s) whenever a power failure is detected. Also the operator will be given the capability of manually initiating a start-up and shut-down interrupt.

The present MG set has the capability of maintaining output 768 milliseconds after a primary power failure. Therefore, a power failure will be defined as the MG set "ride through" time minus the time required for software to process the shut-down fault.

It is most desirable that software be supplied to support these functions, however, there is no requirement for the start-up/shut-down fault processing for the initial shipments of the SCC. This capability is presently being studied and the functional requirements will be defined in a separate document.

4.4 TAB FUNCTION

The Tab Function of the SCC display device is an electronically controlled function that will be cleared whenever power is removed, the software should provide means of setting tabs or reminding the operator to set tabs at start-up time.

4.5 SOFTWARE SWITCH

The software shall provide the operator with the capability of requesting console traffic to be re-directed from one physical console to another. That is, should a failure occur in the interactive console in a system configured with a System Status Display and an auxiliary console, the system would automatically direct all interactive console traffic to the auxiliary console. In this event the operator shall be allowed to request that the System Status Display function be aborted and the channel be used for interactive console traffic.

5.0 RELIABILITY AND MAINTAINABILITY

This section is to be included with Revision B of this document.

6.0 GENERAL DESIGN REQUIREMENTS

The SCC with the display devices and printer mounted shall conform to the General Design Requirements for 655 and 355 Systems, 43A117851 with the possible exception to shipment.

The design of the printer, an O.V. device, and the POOC produced display device will be altered for the SCC implementation. The new design and mounting in the SCC cabinet might require that these devices be removed from the SCC cabinet for shipment.

6.1 UL APPROVAL

It is a requirement that the SCC Assembly meet UL listing requirements, specifically UL478 "Standards For Safety, Electronic Data Processing Units and Systems".

Honeywell

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H-6000 SYSTEM CONTROL CENTER EPS-1

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9/17/71

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Series 6000

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Note: The above comments by Beatson, Conover, Longanecker, Ruth Wilkinson and Williams was satisfied in section 1.1 prior to releasing this document.